

CLAIMS

1. A tool-carrying catheter, comprising:
5 an elongate body adapted for insertion into a blood vessel;
a tool section attached to a distal side of said body; and
a guide-channel adapted to carry at least a guide-wire,
wherein said catheter includes an entry port into said guide-channel for said guide wire
and wherein said tool includes a distal exit for said guide wire from said guide-channel, defined
10 in a side of said tool.
2. A catheter according to claim 1, wherein said entry port is proximal to said tool.
3. A catheter according to claim 1, wherein said entry port is distal to said tool.
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4. A catheter according to claim 1, wherein said guide-channel is adapted to carry a second
catheter.
5. A catheter according to claim 4, wherein said second catheter is a balloon catheter.
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6. A catheter according to claim 1, wherein said guide-channel is limited to a distal section
of said elongate body.
7. A catheter according to claim 1, comprising a second guide-channel adapted to carry a
25 second guide wire.
8. A catheter according to claim 7, wherein said two guide-channels share a common
lumen section.
- 30 9. A catheter according to claim 8, wherein said second guide-channel defines an aperture
in its side for said distal exit.
10. A catheter according to claim 1, wherein said tool comprises a balloon.

11. A catheter according to claim 10, wherein said guide-channel is defined through said balloon.

5 12. A catheter according to claim 10, wherein said guide-channel is defined between folds of said balloon.

13. A catheter according to claim 12, wherein said balloon includes a stiffing which defines said guide-channel.

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14. A catheter according to claim 12, wherein said balloon includes adhesive which adheres two parts of said balloon to define said guide-channel.

15. A catheter according to claim 10, wherein said balloon is split to define said channel
15 between two sections of said balloon.

16. A catheter according to claim 15, wherein said balloon is axially split.

17. A catheter according to claim 15, wherein said balloon is trans-axially split.

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18. A catheter according to claim 1, wherein said tool comprises a stent.

19. A catheter according to claim 18, wherein said stent is mounted on a balloon.

25 20. A catheter according to claim 19, wherein said guide-channel is defined between said stent and said balloon.

21. A catheter according to claim 19, wherein said guide-channel is defined between folds of said balloon.

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22. A catheter according to claim 21, wherein said guide-channel is wide enough to accommodate a second balloon catheter.

23. A catheter according to claim 18, wherein said guide-channel is defined by a crimping of said stent.

24. A catheter according to claim 18, wherein said stent includes a dedicated aperture along its length for said exit port.

25. A catheter according to claim 18, wherein said stent defines two guide-channels.

26. A guiding stent comprising a stent body crimped in a radially non-uniform manner to define at least one guide-channel adapted to carry at least a guide-wire.

27. A stent according to claim 26, wherein said channel is designed to accommodate only a single guidewire.

28. A stent according to claim 26, wherein said channel is designed to accommodate a plurality of guidewires.

29. A stent according to claim 26, wherein said channel does not extent along an entire length of said stent.

30. A stent according to claim 26, wherein said channel is adapted to carry a balloon catheter.

31. A stent comprising:

an elongate cylindrical body; and

an aperture defined in a middle section of said body, said aperture including two abutting sections, one of said sections being narrower than the second section at least at said junction.

32. A stent according to claim 31, wherein said stent is defined by a plurality of circumferential expandable bands inter-linked by a plurality of axial links.

33. A stent according to claim 32, wherein said stent has a regular pattern and wherein said aperture is defined by the lack, in said pattern, of one axial link and by the lack of a section of an expandable band between two axial links.

5 34. A stent according to claim 32, wherein said axial links include at least one protrusion and wherein axial links abutting said aperture are configured to have their protrusion point away from said aperture.

10 35. A stent according to claim 31, wherein said stent is adapted to be placed in a target vessel having a varying diameter along the length of the stent and wherein the aperture is narrower towards an end of the stent adapted to be in a narrow wider section of the target vessel.

15 36. A stent according to claim 31, wherein said junction is adapted to be obliterated by expansion.

37. A stent according to claim 31, wherein said aperture is configured to allow passage of an unsheathed balloon catheter passing through it, without snagging of the balloon.

20 38. A stent according to claim 31, wherein said stent is adapted to radially expand more in a portion of the stent to one side of the aperture than in a portion of the stent to the other side of said aperture.

39. A method of folding a balloon to form a channel, comprising:

- 25 (a) providing a balloon catheter having a balloon folded over said catheter;
(b) providing an elongate element between said folds and said balloon, along at least a part of an axial section of said balloon;
(c) providing said elongate element with a bend; and
(d) manipulating said elongate element such that said bend moves in a proximal
30 direction and travels along a contact area between said folds;
(e) refolding said at least a part of balloon, if said moving of said bends unfolded said balloon.

40. A method according to claim 39, comprising holding a proximal portion of said balloon to prevent its unfolding during said manipulating.

41. A method according to claim 39, wherein manipulating said element comprises pulling
5 back a proximal side of said elongate element.

42. A method according to claim 39, wherein manipulating said element comprises pulling back a distal side of said elongate element.

10 43. A method according to claim 39, comprising inserting said elongate element between said folds after folding of said balloon over itself.

44. A method according to claim 39, comprising folding back said elongate element to form
said bend.

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45. A method according to claim 39, wherein folding said balloon, comprises partially inflating said balloon, shaping said balloon to have at least two flaps, deflating said balloon, while maintaining said flaps and folding said flaps over said catheter.

20 46. A method of crimping a stent on a balloon to define a channel, comprising:
providing a stent over a balloon;
crimping said stent using a mold with having a cross-section which is not radially symmetric for at least part of its length, thereby defining a channel.

25 47. A method according to claim 46, wherein said cross-section is that of a circle with a bulge.

48. A method according to claim 46, wherein said mold has a circular cross-section for part of its length and a non-circular cross-section for a second part of its length.

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49. A method according to claim 46, comprising inserting a stylet form in an axial direction along and within at least part of said stent.

50. A method according to claim 49, wherein said stylet exits said stent at a middle section thereof.

51. A method according to claim 46, comprising repeating said crimping with a second
5 mold having a cross-section smaller than said first mold over at least part of its length.

52. A method according to claim 46, wherein said mold splits along its length.

53. A method of forming a crimped stent with a channel, comprising:

10 crimping at least a portion of said stent on a balloon catheter, such that an axial channel remains defined by at least one of said balloon and said stent, within the volume enclosed by said stent, said axial channel having a maximum trans-axial extent; and

passing a stylet having a trans-axial extent larger than said maximum trans-axial extent of said channel, through said channel, thereby distorting said stent about said channel.

15 54. A method according to claim 53, wherein said channel is defined between folds of said balloon.

55. A clip for adjusting guidewires, comprising:

20 a first jaw and an opposing second jaw and adapted to open by relative rotation about a first axis;

a pair of spaced apart channels defined between said jaws and having a same general direction as said first axis, said channels being sterile and smooth enough to allow slippage of an elongate medical tool only in an axial direction therethrough.

25 56. A clip according to claim 55, wherein one of said channels is sized for a catheter and one is sized for a guide-wire.

57. A clip according to claim 55, wherein both of said channels are sized for catheters.

30 58. A clip according to claim 55, wherein said jaws are elastically pre-disposed to close and comprising extensions of said jaws on an opposite side of said axis, which when pressed together open said jaws.

59. A kit comprising:

a balloon catheter having a stent mounted thereon and defining a channel with an exit in a side of said stent; and

5 a second balloon catheter configured to be passed through said exit.

60. A kit according to claim 59, wherein said second balloon catheter has a second stent mounted thereon, said stents being configured to cooperate with said stent to provide support to a blood vessel at a bifurcation.

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61. A catheter adapted for quick removal, comprising:

an elongate catheter body, defining a guide-wire channel at a distal end thereof, said channel having a proximal entry port and a distal exit port,

15 wherein said channel defines a weakening therein, which weakening is openable such that said channel is open for release of a guidewire from said entry port to said exit port.

62. A kit including a catheter according to claim 61, and including a second catheter having a forward element adapted to tear said channel when it contacts said entry port of said catheter.

20 63. A kit including a catheter according to claim 61, and including a tube adapted to tear said channel when it contacts said entry port of said catheter.

64. A method of tool removal from a body, comprising:

25 bringing together a forward tearing element of a proximal device mounted on a guide wire and an entry port of said guidewire in a distal device, by motion of at least one of said proximal device and said distal device;

continuing said bringing together such that said forward tearing element opens a channel of said distal device and disconnects it from said guidewire; and

retracting said distal device.

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65. A method according to claim 64, wherein said opening of said channel comprises tearing.

66. A method according to claim 64, wherein said bringing together comprises advancing said proximal device, while maintaining a position of said distal device.

67. A method of implanting a stent in a bifurcation, comprising:

- 5 placing two guidewires, one into each of two branches of a bifurcation;
mounting a stent on said two guide wires such that at least one guide wire exits through an aperture in a side of the stent; and
deploying said stent to engage a blood vessel at said bifurcation.

10 68. A method according to claim 67, wherein mounting comprises mounting after said placing.

69. A method according to claim 67, wherein mounting comprises mounting before placing.

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70. A method according to claim 67, comprising providing a balloon catheter into a side vessel of said bifurcation after at least roughly positioning said stent in another side vessel of said bifurcation and prior to deploying said stent.

20 71. A method according to claim 67, comprising providing a balloon catheter into a side vessel of said bifurcation after positioning said stent in another side vessel of said bifurcation and after deploying said stent.

25 72. A method according to claim 67, comprising providing a balloon catheter into a side vessel of said bifurcation after positioning said stent in another side vessel of said bifurcation and partially expanding said stent.

30 73. A method according to claim 67, comprising expanding a balloon catheter in a side vessel of said bifurcation to assist in positioning said stent in another side vessel of said bifurcation.